AVO INTERNATIONAL

PulseMaster™ Software

VOLUME I--USER'S GUIDE

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Rev. 2.0 12/1/94

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CHAPTER 1.0 INTRODUCTION

Chapter Overview

This chapter provides the basic introductory material for the ***PulseMaster*** software. Here the user may find information on the following:

System Description
Support Policy
Copyright
Hardware Requirements

Refer to this chapter for information on any of the topics listed above.

CHAPTER 1.0

1.1 System Description

1.1.1 Software

PulseMaster software allows the user to create, modify, and/or run automated, computer controlled protective relay test programs.

The ***PulseMaster*** software program marks the next generation of relay testing software. It is specifically designed to test protective relays and store the test results. *In addition to performing steady-state and dynamic testing, when used with* ***PULSAR*** *Universal Test System, it is also capable of playing back either recorded (Digital Fault Recorders) or simulated (EMTP or mathematically generated) fault data, which is used to do transient testing.*

PulseMaster is specifically designed to control the **AVO Multi-Amp PULSAR** and **EPOCH** series of protective relay test sets. The software routines in ***PulseMaster*** send control signals to the **PULSAR** and **EPOCH** sets via an IEEE-488 (GPIB) computer control bus or RS-232C (for **PULSAR** only) communications line. See section **1.4 Hardware Requirements** for more information.

NOTE: Either RS-232 line or IEEE-488 GPIB may be used to communicate with **PULSAR**; but only IEEE-488 GPIB can be used to communicate with **EPOCH(s)**.

Test results are stored in a dBASE IV® Version 1.5 compatible database. The software features the ability to print results in both tabular and graphical formats.

1.1.2 Documentation

PulseMaster documentation is provided in three volumes as follows:

Volume I -- User's Guide

The User's Guide (this volume) contains the basic program description, information required for basic installation and configuration of ***PulseMaster*** as well as explanations and examples for testing various types of protective relays. The examples provided use testing libraries furnished by **AVO Multi-Amp.**

We recommend that the person using the ***PulseMaster*** software have Volume I handy at all times when testing relays.

Volume II -- Programmer's Guide

The Programmer's Guide contains the information required to modify or create test routines. Whether mixing pre-written (canned) test routines supplied by **AVO Multi-Amp** or by other users, or creating brand new routines in **MACSART** or in the ***PulseMaster*** macro language, Volume II is the documentation required.

In addition to explanations of the ***PulseMaster*** macro language and **MACSART**, Volume II has a complete, documented example for a SEL-121G relay.

Anyone with test program development or modification responsibilities will require the use of Volume II.

Volume III -- Reference Guide

The final volume of documentation provides a detailed reference for all aspects of the ***PulseMaster*** software. You will find a complete screen reference, detailed explanation of supplied test libraries and ID's, a complete **MACSART** language reference, a complete ***PulseMaster*** macro language reference and other invaluable information.

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1.2.3 Extended Software Support Service

An extended support program is available to provide ongoing support to Licensed Users of ***PulseMaster*** beyond the provisions contained in the "AVO Multi-Amp Corporation Software License Agreement."

The ***PulseMaster*** Extended Support Program provides a free copy of any new release(s) or update(s) of the program for one year after registration or for one year after expiration of the initial warranty period, whichever is later. A customer can register for a maximum of two(2) years at a time only.

Additionally, subscribers to the Extended Support Program have direct access to ***PulseMaster*** support personnel via a toll-free telephone number. For details, contact your local sales representative or AVO Multi-Amp Corporation's Technical Marketing and Support Department.

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1.3.1 Copyright

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1.4 Hardware Requirements

PulseMaster requires the following minimum PC system and accessories.

- IBM PC (80286 minimum, 80386 SX or DX recommended), Portable PC or 100% compatible.
- PC/MS-DOS version 3.1 or later. DOS 5.0 is recommended.
- MS Windows 3.1 or later.
- One 3.5" floppy diskette drive. Drive may be double or high density.
- Video Monitor: Any monitor supported by Windows drivers.
- Hard Disk: 40 MB or larger is recommended.
- RAM: 2 MB minimum. 8 MB recommended for transient testing.
- National Instruments GPIB-PCIIA IEEE-488 Interface Board with associated driver software.
- Any printer supported by Windows if hard copy printouts are desired.

- If IEEE-488 parallel communication is desired, an expansion slot: One half-size, 8-bit.

- If serial communication is desired, a RS-232C COM port is needed.

IMPORTANT:

The IEEE-488 driver (software) must be installed in order to communicate with EPOCH or PULSAR with IEEE-88 option). Note also that it is already installed when you buy the controller with IEEE-488 Interface Board, from AVO Multi-Amp Corporation.

This listing delineates the minimum hardware requirements. While some alternative configurations may work properly, AVO Multi-Amp Corporation makes no warranties or guarantees.

NOTES

CHAPTER 2.0 GETTING STARTED

Chapter Overview

This chapter guides you through the installation, startup, and configuration of the ***PulseMaster*** software. We strongly recommend that the new user read all of this chapter thoroughly.

If your version of ***PulseMaster*** is already installed, you may still wish to read Section 2.2 to learn about the proper method to start ***PulseMaster***.

CHAPTER 2.0

2.1 Installation

PulseMaster is designed to be installed on and operated from a hard disk system.[1] ***PulseMaster*** is supplied on 3½" diskettes.

Before beginning the installation you may wish to copy the contents of each disk onto separate disks. It is advisable to label these copies for future recognition. One copy will serve as backup should anything happen to the originals. The second, or working copy, can be used to install the software. Refer to your DOS manual for making these copies.

The installation procedure consists of the following general steps:

NOTE: This procedure assumes that you are using the '**A**' floppy diskette drive for your ***PulseMaster*** diskettes. If you are using the '**B**' drive, simply insert '**B**' every place the procedure mentions the '**A**' drive.

1. Start Windows and insert ***PulseMaster*** Disk #1 into the 'A' drive.

2. Run setup as follows:

1. The "hard" disk may be called a "fixed" disk in your computer documentation.

a. From the **File** menu in **Program Manager** or **File Manager**, choose **Run**. The following run dialog box appears:

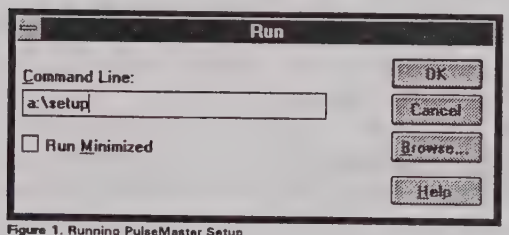

Figure 1. Running PulseMaster Setup

b. Type in the path and name of the program (**a:\setup**).

c. Click **OK**, or press **<Enter>**.

d. Follow the on-screen directions and insert diskettes as requested. A program group will be created in Windows, with icon. ***PulseMaster*** is now installed and may be invoked from Windows.

e. Remove the diskette from the '**A**' drive and return it to its protective envelop and enclosure.

2.2 Start up

The following steps are required to start up the Windows version of ***PulseMaster***:

2.2.1 Method I:

1. Power On the PC.
2. Start Windows.
3. Open the group that has the ***AVO PulseMaster*** icon.

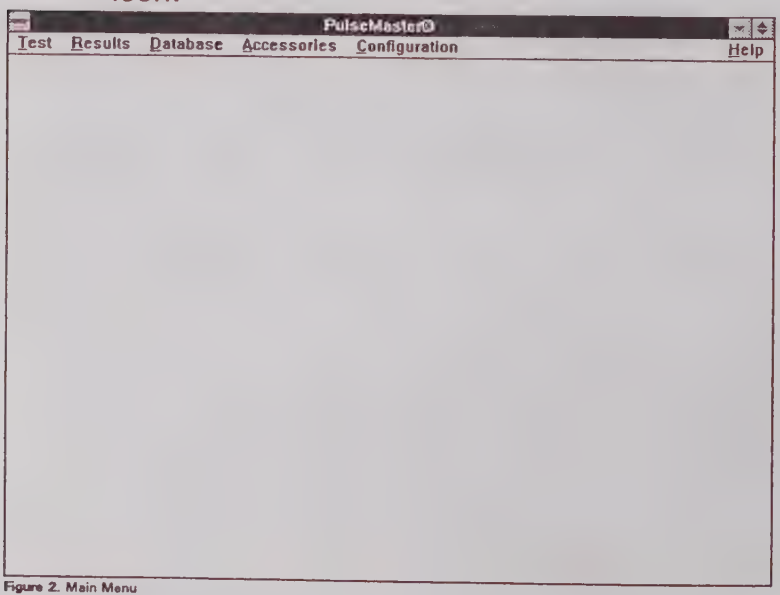

Figure 2. Main Menu

4. Double Click the ***AVO PulseMaster*** icon.

2.2.2 Method II:

1. Power on the PC.

2. Type "WIN PULSMSTR" at the **C:\>** prompt.

2.2.3 Method III:

If you are using Windows 3.1 or later, put the ***AVO PulseMaster*** icon in the **Start Up** group. See Microsoft Windows' manual for details.

If the screen shown in Figure 2 does not appear, review Section 2.1 Installation. If you believe that you have not installed ***PulseMaster*** properly, reinstall it. If, after reinstalling ***PulseMaster*** you are still unable to start up, contact **AVO Multi-Amp** for assistance.

2.3 Navigation

2.3.1 Help Screens

If this is your first visit to ***PulseMaster,*** click or select the **<Help>** button. **Take a few moments now and read each of the screens thoroughly.**

The **<Help>** button will bring up help screens throughout the program (see Figure 3). Each help screen is called "context sensitive". This means that the help screen will offer information related to the part of the program that you are in.

2.3.2 Navigating *PulseMaster*

Moving around the ***PulseMaster*** menu screens and selecting a given menu , sub-menu or option can be accomplished in one of two ways:

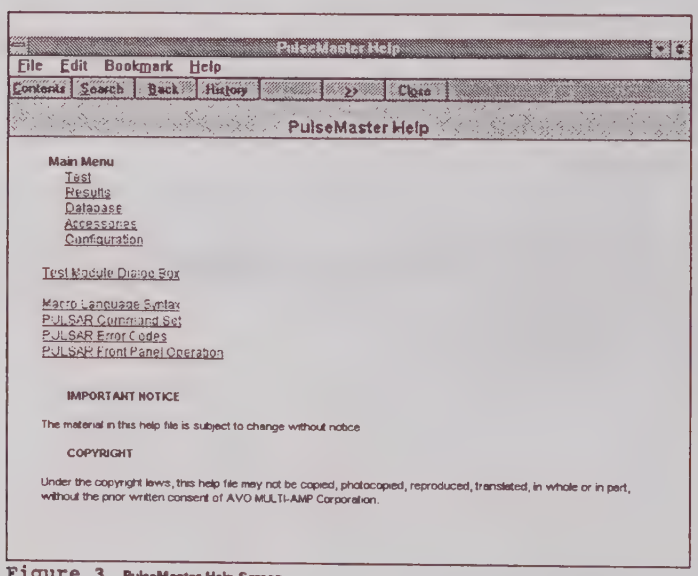
PulseMaster Help
File Edit Bookmark Help
Contents Search Back History >> Close
PulseMaster Help
Main Menu
Test
Results
Database
Accessories
Configuration
Test Module Dialog Box
Macro Language Syntax
PULSAR Command Set
PULSAR Error Codes
PULSAR Front Panel Operation
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Figure 3. PulseMaster Help Screen

- Utilizing the keyboard by pressing the keys: **<Alt>** + **<Letter>** keys for menus and **<Letter>** keys for sub-menus. If a name in the menu bar has an underlined letter, you can press **<Alt>** to move to the menu bar , and then type the letter that's underlined to open the menu. Special keys (**<Tabs>**, **<Arrows>** etc.) for moving around in a menu; and alpha-numeric keys to enter data.

  OR,

- Utilizing a mouse and clicking on desired function(s) or button(s).

For example, to select the '**Test**' (Figure 2) menu, simply press <**Alt**> + <**T**> keys or place the mouse pointer on '**Test**' and click (depress the left button on the mouse).

NOTE: If a given function is dim or shaded out, that function can not be selected.

2.4 *PulseMaster* Software Configuration

2.4.1 Introduction

This section allows the user to set up or "Configure" ***PulseMaster*** to meet his or her system requirements. Section 2.4 is not intended to be a complete configuration guide. Rather sufficient material is provided to allow the user to get "up and running" and to use the software to successfully test relays and save data. For a more complete explanation of the Configuration options, see **Volume III -- Program Reference Guide**.

To reach the **Configuration** menu, do the following:

1. Start ***PulseMaster*** (See Section 2.2).
2. From the menu bar select Configuration. The Configuration Menu will appear (Figure 4).

3. Invoke the configuration item as desired. Detailed explanations of the **Directories**, **Addressing**, **Header Titles** and **Save Configuration** options are given below. These options are detailed here because they are necessary to test relays and save results using ***PulseMaster*** software.

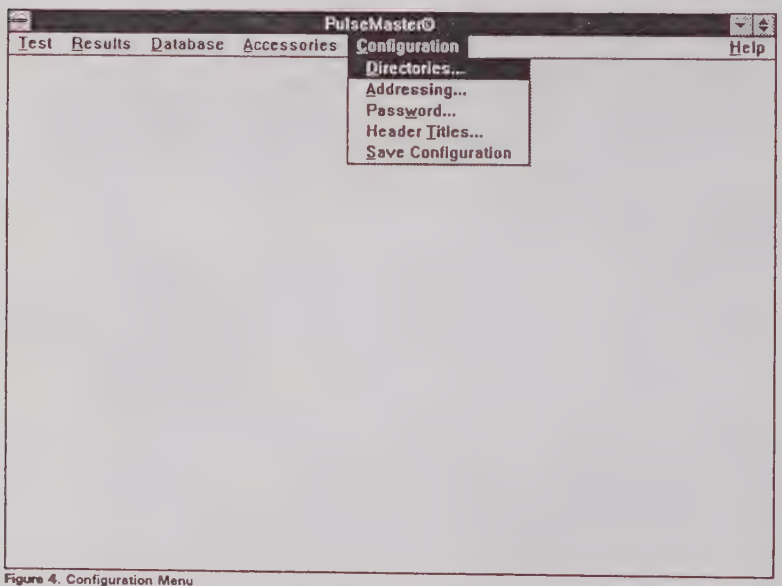

Figure 4. Configuration Menu

Brief explanation is given of the **Password** since this item is not critical to the basic purpose of Volume I.

2.4.2 Directories

When you select the **Directories** option, the dialog box shown in Figure 5 will appear. The first time that you

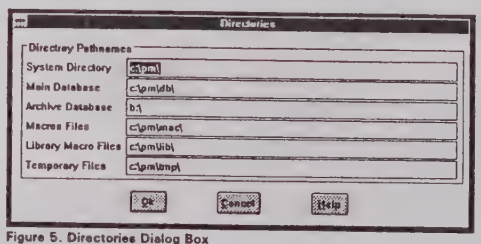

Figure 5. Directories Dialog Box

select **Directories**, the screen will appear exactly as shown in Figure 5 unless you have installed ***PulseMaster*** somewhere else other than the default directories.

2.4.3 Addressing

This dialog box is used to define each instrument and its interface to the program. ***PulseMaster*** can be used to control either **EPOCH** or **PULSAR** relay test sets. However, in order to insure proper communication between ***PulseMaster*** and the instrument under control, each instrument must be addressed correctly. Instrument addressing is quite different for **EPOCH** and **PULSAR**. Follow the guideline below for proper addressing.

2.4.3.1 **EPOCH** Addressing

PulseMaster can communicate with **EPOCH** sets via IEEE-488 GPIB only. The **EPOCH** address for each **EPOCH** relay test set is determined by a dip switch setting on the GPIB (IEEE-488) interface card. (Specific instructions for this change is found in the individual **EPOCH** instruction manuals). The address for each **EPOCH** is displayed on its front panel during power up.

IMPORTANT:

Each EPOCH must have its own unique address so that PulseMaster will know how to find it. However, 0 (zero) can not be used.

During the startup of your EPOCH units, be certain that each address is unique. After you have determined that each has its own, then use the procedures outlined in this section to set up the PulseMaster software to properly address the test sets.

Selecting **Addressing** from the **Configuration** menu brings up the **Instrument Addressing** dialog box as shown in Figure 6.

EPOCH addresses may be any number between 1 and 15. An **EPOCH-III** or **30** must be only in Logical Address 1. Any unit given an address of '0' will be ignored by ***PulseMaster***.

The following paragraphs describe how each **EPOCH** type should be addressed.

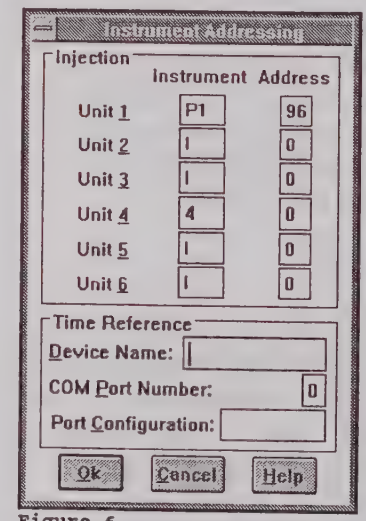

Figure 6. Instrument Addressing Dialog Box

Unit 1

Numbers 1, 3, 4, 5, 10, 30, 40 may be used. Or, if you prefer, you may use Roman Numerals I, III, IV, or V.

Units 2 -> 6

For these units only 1, 4, 5, 10, 40, I, IV, or V may be used.

The **EPOCH** types located at the addresses given must match the types listed in the **Instrument Addressing** table. See the help screens for the **Instrument Addressing** table for more information on error messages that will occur if you have not addressed them properly.

Example:

Assume that you have the following **EPOCH** configuration.

EPOCH-I/10 -- Address 1
EPOCH-I/10 -- Address 2
EPOCH-III/30 -- Address 9
EPOCH-IV/40 -- Address 3

The **Instrument Addressing** table should be set up as follows:

	Instrument	Address
Unit 1	III/30	9
Unit 2	I/10	1
Unit 3	I/10	2
Unit 4	IV/40	3
Unit 5	I/10	0
Unit 6	I/10	0

Of course other arrangements are possible, but this will serve as an example. Note that the **EPOCH-III/30** must be identified as Unit Number 1.

The key points are:

1. Every **EPOCH** you wish to use must have a unique non-zero address.

2. If you wish ***PulseMaster*** to ignore any **EPOCH**, then give it an address of 0.

3. An **EPOCH-III/30** must be assigned as Unit 1.

2.4.3.2 **PULSAR** Addressing

PulseMaster is capable of communicating with **PULSAR** test set either via RS-232 line or via an optional IEEE-488 GPIB. **PULSAR** should be addressed as follows.

Pxx

'**P**' is used to indicate **PULSAR** and is followed by the following information. The two xx's are used as place holders. A blank or * for either x's disables **PULSAR** Translation Mode (In translation mode **PULSAR** translates **EPOCH** commands to **PULSAR** commands). A blank (for GPIB), a 1 (for COM1) or a 2 (for COM2) may be used for the first x.

2.4.3.3 **PULSAR** via RS-232

When **PULSAR** is controlled via RS-232, a 1 is used for COM1 and a 2 is used for COM2 for the first 'x'. Additionally, the address field is used to enter the baud rate to be used. Legal entries are 24, 48 and 96 for 2400, 4800 and 9600 respectively. 19 should be used for 19.2 kbaud rate.

NOTE: 19.2 KBaud rate can only be used for the consecutive transfer of data in increments of less than 4K bytes without the delay of approximately 2 seconds before sending another consecutive data transfer. So, it is recommended that the communication baud rate of 19.2K should be avoided. Because, at this baud rate occasional communication break downs may occur.

Example:

	Instrument	Address
Unit 1	P1	96

This set up would control **PULSAR** via COM1 at 9600 baud rate. The translator will also be on or active (no '*' for second 'x')

2.4.3.4 **PULSAR** via IEEE-488

When **PULSAR** is controlled via IEEE-488, a blank is used for the first 'x'. For the second 'x' a blank

or '*' may be used. An '*' disables the PULSAR Translation Mode. while a blank does not.

For an instrument using the GPIB, the addresses 0 -> 15 may be used. The address of '0' disables communications with the instrument (EPOCH or PULSAR).

Example:

	Instrument	Address
Unit 1	P	1

2.4.3.5 Time Reference

The **Time Reference** section of the **Instrument Addressing** dialog box helps define the communication configuration to be used with an external time reference generator; capable of event triggering and time tagging. This feature will be used for running an **END-TO-END** test on a transmission line. Please see Volume III, Section 4.6.2.5 and Chapter 9 for details.

2.4.4 Password

The ***PulseMaster*** password system allows the user to control access to various parts of the program. When you select the **Password** option, the **Password** dialog box (Figure 7) is displayed.

There are two passwords used in ***PulseMaster***, the "master" password and the "user" password.

User Password

The "user" password allows the user access to the **Test Specifications** dialog box, where a generic library module may be modified. You will not be able to modify tests or make major changes in the test routines.

Master Password

This password allows the user complete access to all facets of the program, including test routine revisions.

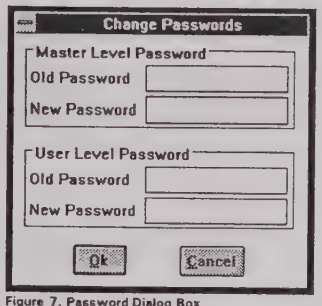

Figure 7. Password Dialog Box

PulseMaster is shipped with the passwords set to "xxxxxxxxx" or nine (9) lowercase x's. Also password protection is turned off. If you wish to change either password, you must first enter the old password followed by the new one.

Although password protection does provide some additional level of security, we recommend that the use of passwords be avoided where possible. See Volume III for more detailed information on passwords.

2.4.5 Header Titles

PulseMaster is designed in such a way that only minimum changes are required when testing the same types of relays with different settings. The key to this feature is called the "Header". The header is the "information" screen for any given test routine.

The default header titles are Name, Model, Substation, Location, Date, Co. Number, Breaker, Manufacturer. Normally the user will fill in each one of these for each substation or line terminal tested.

Realizing that some companies may wish to have titles other than those identified above, ***PulseMaster*** allows you to modify them. For example, rather than Co. Number: you may wish to enter "Serial Number" (See Figure 8).

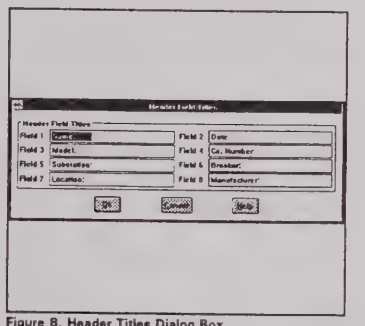

Figure 8. Header Titles Dialog Box

NOTE: If you change the Header Titles, be sure to change them in the macros -- HEADER.MTP, REPORT_1.MTP, REPORT_2.MTP, REPORT_3.MTP, REPORT_4.MTP and REPORT_5.MTP. If you don't do so, the changes you had made won't be reflected in the results data since these macros are used to print and generate reports on test results.

2.4.6 Save Configuration

After you have completed or modified the ***PulseMaster*** configuration, you must select **Save Configuration** option to make the changes permanent. If you modify or set up the configuration and then do not save it, the changes will be lost when you exit *PulseMaster.*

WARNING

Save Configuration option saves the **Module Filters** setting also. So, use it cautiously.

NOTES

CHAPTER 3.0 PROGRAM OVERVIEW

Chapter Overview

As the name implies, this chapter provides an overview of the entire ***PulseMaster*** software package. Here you can get information about Level 1, 2, and 3 users as well as a complete picture of how the program flows from beginning to end. The information in this chapter is divided into the following Sections:

User Categories
Program Flow

You should read this section thoroughly before you go on to Chapter 4.0. This chapter will give you information that you must have before you can use the program to test relays.

3.1 User Categories

PulseMaster allows three user categories....Level 1, Level 2 and Level 3. Each of these categories is explained below:

3.1.1 Level 1

At this level the user can load and run library modules, whether provided by **AVO Multi-Amp** or written by a level 2 or 3 user. These library modules contain all of the necessary tests for a given relay. Relay connections as well as entire documents can be linked to these test libraries so that the information the user needs can be readily obtained. The user requires minimal PC/MS-DOS and Windows knowledge.

3.1.2 Level 2

The Level 2 user can choose from preprogrammed packages to build the test routines necessary to test a given relay. Parameters such as starting and ending voltages, currents, and ramp speed can be easily modified to assure that these routines meet the Level 1 user's testing needs. Test connections, header information, and information files can be created and stored for reference. This level is designed for users with a solid knowledge of relay testing and some PC/MS-DOS and Windows experience.

3.1.3 Level 3

This is the level at which ***PulseMaster*** can be fully programmed in all aspects. This user should have a solid understanding of DOS, Windows, relays, and the **'BASIC'** programming language. This level is the most complex but provides the user with the most flexibility.

3.2 Program Flow

Figure 9 shows a rough block diagram of the ***PulseMaster*** program.

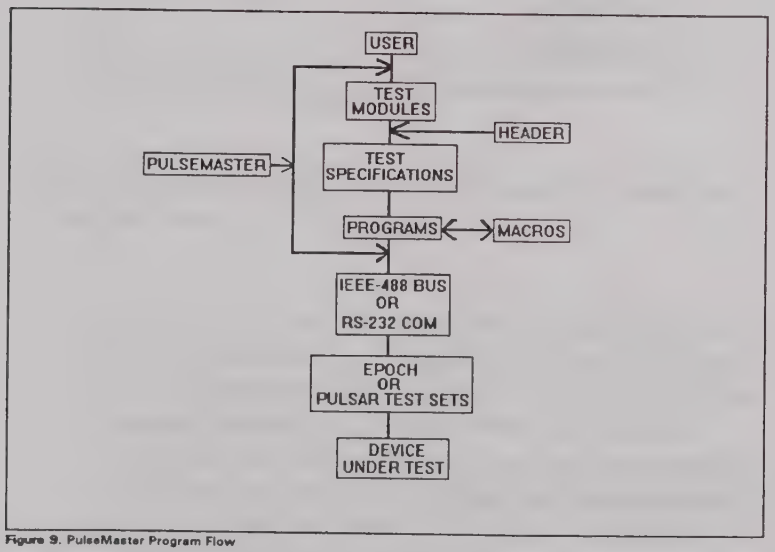

Figure 9. PulseMaster Program Flow

To fully understand this next section, we recommend that you have ***PulseMaster*** on the screen in front of you so that you can follow along with the explanation.

- From the **Main Menu** select **Test**. The **Test** menu (Figure 10) will appear.

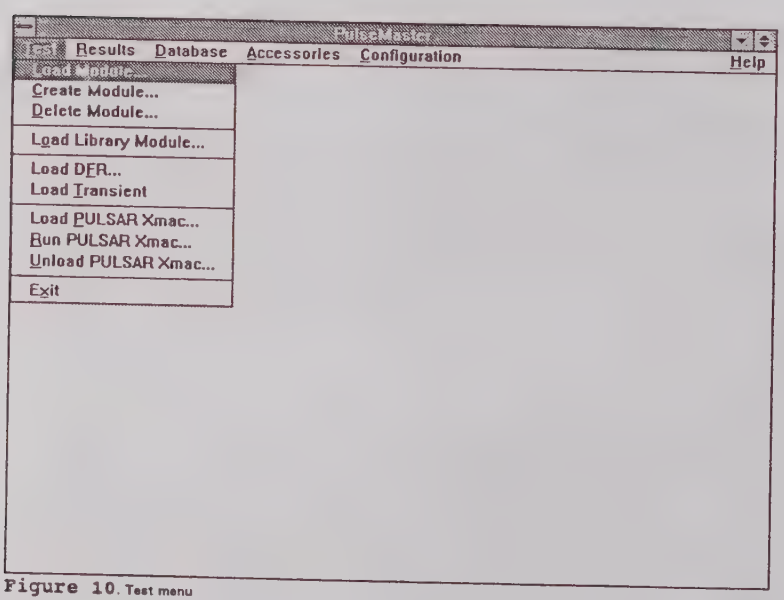

Figure 10. Test menu

From the **Test** menu select **Load Module.** The **Select a Test Module** menu will appear (Figure 11).

The modules shown in Figure 11 are the test modules that are supplied by **AVO Multi-Amp** with the ***PulseMaster*** software package. Your screen

may have more modules than those shown, if your Level 2 or Level 3 users have been developing additional test modules for your company's needs.

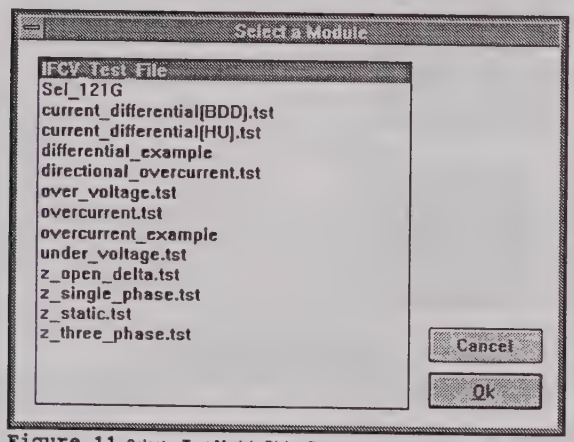

Figure 11. Select a Test Module Dialog Box

Each of these modules contains several tests for various relays.

- From the **Select a Test Module** menu select "overcurrent.tst". The screen shown in Figure 12 will appear. This screen is called the **Test Control Center** or **Test Module** dialog box. The right portion of this screen offers a variety of functions that an user can perform (more later). A list of tests will appear on the left side of the screen with the first test being highlighted. ***PulseMaster*** will perform all these tests, one at a time, on an overcurrent relay.

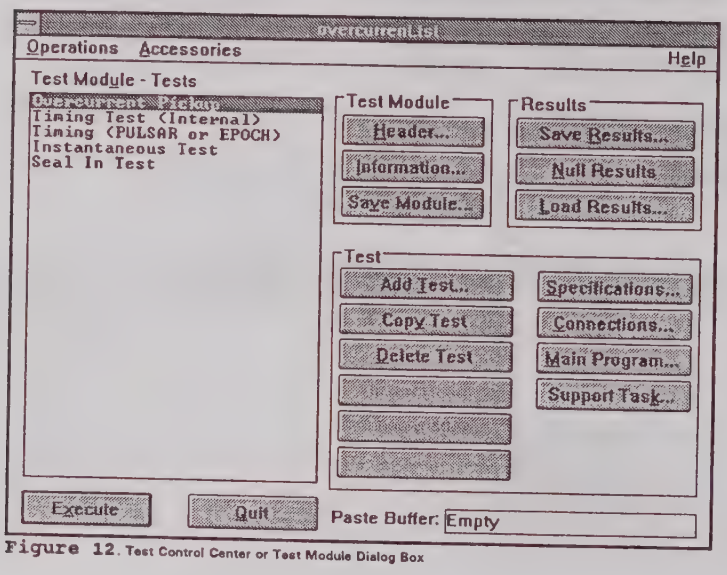

Figure 12. Test Control Center or Test Module Dialog Box

To test an overcurrent relay, you will invoke each of these tests one at a time.[1]

- From the **Test Module** group push **Header** button. The Header Information dialog box (Figure 13) appears. The Level 1, 2 or 3 user can enter relay specific information in this screen. This information is stored with the test routine and results. Notice at the bottom of the header screen, there are statements like:

1. Notice that the Timing Test has two options...internal and EPOCH. You may choose to time the relay using the ***PulseMaster*** internal computer timer or the **EPOCH** timer on an **EPOCH-III/30** or **EPOCH-IV/40** or **EPOCH-V**. If using a PULSAR unit with a Timer Module use the Timing Test (EPOCH).

tap = 2

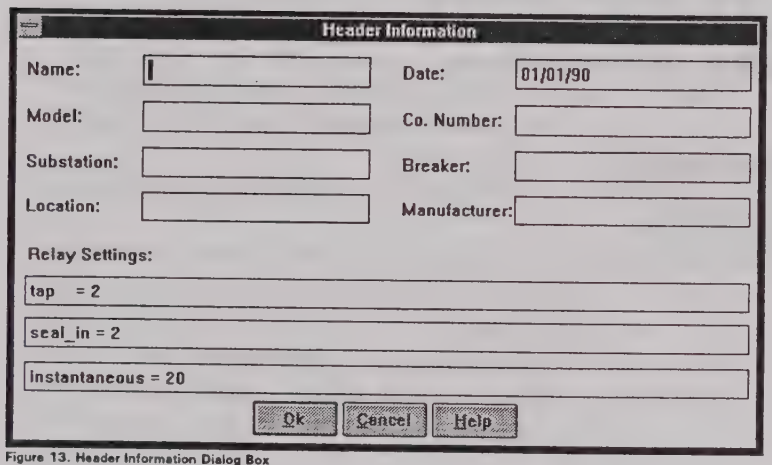

Figure 13. Header Information Dialog Box

This is how the user modifies the pickup values for a specific relay. Press the <Esc> key or click on **Cancel** or **Ok**.

- From the **Test** group (lower right-hand), select **Specifications**. The Test Specifications dialog box (Figure 14) will appear.

  This screen is the one that defines the basic parameters for a given test. The Level 2 or 3 user can create or customize the parameters as required.

- Each specifications box has programming code stored in the ***PulseMaster*** database files.

- To see the code for the overcurrent pickup, click on **Ok** or **Cancel** as appropriate, to exit to the **Test Control Center** or **Test Module** dialog box. Then click on **Main Program** from the **Test** group.

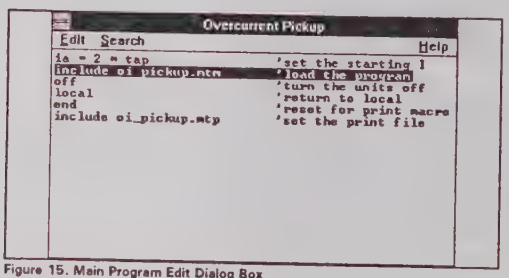

Figure 15. Main Program Edit Dialog Box

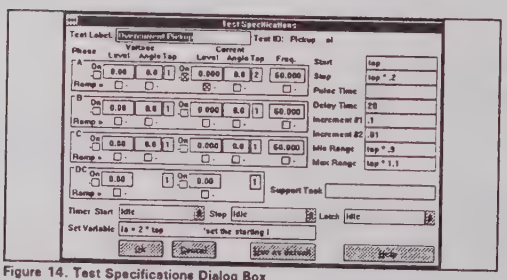

Figure 14. Test Specifications Dialog Box

The screen shown in Figure 15 will appear. From here on, this screen or window will be referred to as the **Main Program Dialog Box**.

- The lines of code shown in the **Main Program Edit** box are the lines that tell the program what to do. Some of the programs have a command called "include". For example, if you have been using the overcurrent relay example, you will see a line of code in the **Main Program Dialog Box** that says:

  include oi_pickup.mtm 'load the program

  This command tells the program to go get another file (macro) and do what it says at that point. In the example above, when ***PulseMaster*** gets to the "include" command, it will go get the file (macro) oi_pickup.mtm and do what it finds in that file (macro). The file oi_pickup.mtm is called a "macro".

  Macros are subroutines which allow the Level 3 user to write routines that may be used or shared by several programs. For example, the oi_pickup.mtm macro will issue the commands to the **EPOCH** or **PULSAR** to cause them to test pickup on an overcurrent relay.

  Since this is a test that will be used for many different types of relays, the code is put into a macro to be reused as needed.

  The Level 1 and Level 2 user do not need to concern themselves with macros. The level 3 user will do the programming. Macros are mentioned here only to detail the construction of the ***PulseMaster*** program.

- Close this window using standard Microsoft Window's procedure (double click on the upper left-hand corner).

- Select **Quit** to exit or to get to the **Main** Menu. The following screen (Figure 16) will appear.

This dialog box asks for some information. For now, just select **Ok**.

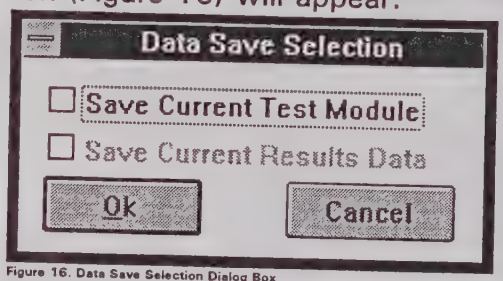

Figure 16. Data Save Selection Dialog Box

The programs and macros output commands on the communication bus to the **EPOCH** or **PULSAR** relay test sets. They are written in either the ***PulseMaster*** macro language set or the MACSART **EPOCH** language set or the **PULSAR** language set. Using the programs and macros, the user can test virtually any type of protective relay in a fully automated manner.

This completes the overview of the ***PulseMaster*** program. The next chapter will take the user through step by step instructions for testing a CO-9 overcurrent relay and a BDD differential relay.

NOTES

NOTES

CHAPTER 4.0 RELAY TESTING

Chapter Overview

In this chapter you will work through two complete examples of relay testing using the ***PulseMaster*** program. The examples used are a Westinghouse CO-9 overcurrent relay and a General Electric BDD differential relay. The information in this chapter is divided into the following Sections:

Introduction
Example -- (CO-9)
Example -- (BDD)

If this is your first time with ***PulseMaster*** you should follow these examples carefully. We recommend that you have a complete **EPOCH** or a **PULSAR** system set up so that you can follow them by actually testing the relays.

4.1 Introduction

This chapter takes you through two examples of using ***PulseMaster*** to test protective relays. While you do not have to have any **EPOCH** or **PULSAR** test sets connected to go through the examples, we recommend that you use them to familiarize yourself with the way they work. These examples assume that you are familiar with the operation of the **EPOCH** or **PULSAR** test equipment. Refer to the **EPOCH** or **PULSAR** instruction manuals for complete operating instructions.

In each example you will be taken, step by step, through the entire test procedure using the following plan:

1. Start ***PulseMaster***
2. Set **EPOCH** or **PULSAR** addresses
3. Load test module
4. Check header
5. Perform each test
6. Save results module
7. Print reports

The example test routines are included on the ***PulseMaster*** master diskettes. After you have completed the examples, you may delete them using the ***PulseMaster***'s **Delete Module** command found on the **Test** menu under the **Main Menu**. If you delete these examples, be certain to have a Level 2 or 3 user delete the macros found in the

macro directory.[1] These macros must be deleted using the Windows Deletion command from File Manager.

RECOMMENDATION:

As new users will need training from time to time, we recommend that you leave the example test modules on the disk for future training needs.

This section assumes that you have installed and configured ***PulseMaster*** as described in Chapter 2.0 of Volume I.

For convenience, sample test result modules have been provided for each of the example procedures. In this way you can follow through the examples without actually performing tests.

4.2 Example -- Overcurrent Relay (CO-9)

4.2.1 Starting *PulseMaster*

Refer to the **EPOCH** or **PULSAR** instruction manuals for the proper way to setup and connect them. Be certain that the interfacing cables have been properly connected between the **EPOCH** or **PULSAR** test sets and ***PulseMaster***.

1. If you installed PulseMaster in the default paths the file will be found in the 'c:\pm\mac' directory.

The proper way to start ***PulseMaster*** is described in Section 2.2 of this volume. Using standard Windows procedure start ***PulseMaster***. The **Main Menu** should appear (Figure 2).

4.2.2 Setting the Instrument Addresses

Refer to section 2.4.4 for a complete description on setting the **EPOCH** or **PULSAR** addresses.

NOTE: If you are using **EPOCH**s, you should need only an **EPOCH-I** or **10**. The test values have been selected to allow a single unit to provide the necessary test current. Timing is performed with the ***PulseMaster*** internal (software) timer so you do not need an **EPOCH-IV/40**.

4.2.3 Loading the Test Module (Overcurrent)

Load the overcurrent example test module by using the following steps:

1. From the '**Main Menu**' select **Test**. The **Test** menu (Figure 10) will appear.

2. Select **Load Module**. A listing of test modules will show. Use the <**Arrow**> keys or the mouse to highlight '**overcurrent_example**'. (If '**overcurrent_example**' is not one of the choices, someone may have removed it earlier. You can load it into your database by using the **Backup, Merge, Archive** selection on the **Database** menu. See Volume III for more

details.) Select 'overcurrent_example'. Press <Enter> or click on Ok.

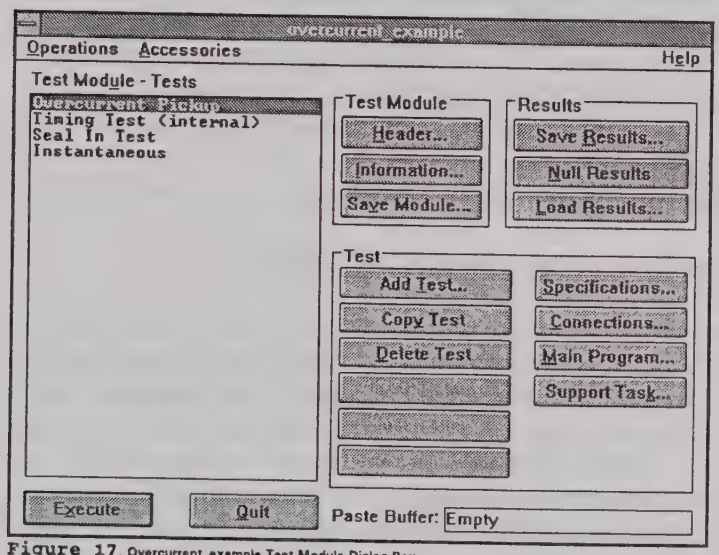

Figure 17. Overcurrent_example Test Module Dialog Box

3. The screen shown in Figure 17 will appear. The 'overcurrent_example' test module is now loaded.

4.2.4 Checking the Header Information Dialog Box

To verify and review the header information choose **Header** from the **Test Module** menu. The overcurrent_example header information screen (Figure 18) will appear.

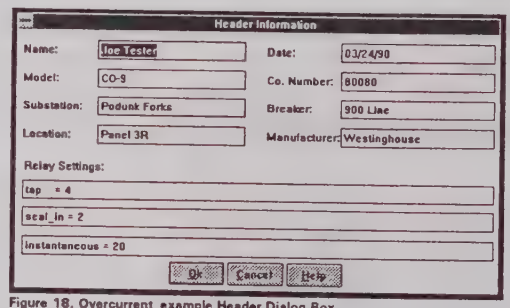

Figure 18. Overcurrent_example Header Dialog Box

The header screen contains a variety of information that is necessary for the test module. The information that is at the top, includes things like the tester's name, relay model, date, company number and so on. The lower section contains information such as the tap, seal_in, and instantaneous values. These values are actually variables that are used by the testing program.

The header information will vary for different tests; however, the following information should apply to all examples:

1. Usually the only information that should be changed by a Level 1 user (testing only) will be that which is in the top eight (8) blanks.

2. The information in the lower portion of the screen is determined by the relay settings. Changes should only be made here when relay settings are changed or when one test procedure is used for a variety of different locations.

3. Since changes in the header screen will affect the test results, they should be changed only with full knowledge of what you are doing.

As soon as you have completed your review of the header information, press the <**Esc**> key or click on **Cancel** or **Ok** to exit.

4.2.5 Performing the Tests

IMPORTANT:

If you wish, you may "dry" run the tests with no EPOCH or PULSAR equipment attached. This allows you to evaluate tests before using them. The IEEE-488 driver must be disabled to "dry" run the tests. To disable the GPIB communication, insert an address of '0' for the test set(s) being used. For the purposes of this next section, we assume that you have the EPOCH or PULSAR test sets attached. If you are using PULSAR with RS-232 just unplug the RS-232 line.

After making certain that the **EPOCH** or **PULSAR** test set(s) are connected and the addresses have been properly entered, you may run each of the tests one at a time. To run the test, first highlight it by using the <**Arrow**> keys or the mouse, and then execute it by pressing the <**Enter**> key or choose **Execute**.

After you select a test, its **Execute Test** screen will be shown and the changes that are occurring in current or voltage will show. Be certain to follow the on screen directions that are shown.[1]

At the completion of each test, you will be shown a test results screen along with being asked if you want a hard copy printout. For the purposes of this example, say no. We will print out all of the results later.

Execute each test as described above.

4.2.6 Saving Results

To save the results of your tests, invoke the **Save Results** item from the **Results** button group. You will be given the opportunity to name the results module. Your company should have established procedures for naming the results modules; however, the following general guidelines may help:

1. Try to select meaningful names that relate to the location, date, type of test, or other such descriptive information. For example, you may wish to name the module using the date and relay name such as:

   03/24/90_PODUNK_900_OC

1. If you are a Level 1 user, you need not understand the information shown on the 'ID' screen. This is information that is selected and/or modified by a Level 2 or Level 3 user. See Volumes II and III for complete explanations of the 'ID' screen.

2. Remember that the name you select must be less than 30 characters in length.

3. If you select a name that is already in use, ***PulseMaster*** will alert you and ask if you wish to replace the old module. Selecting '**No**' will allow you to try again for a unique name.

After you have saved your results you may eliminate them by using the **Delete Results** option from the **Results** found on the **Main Menu** or the **Archive Data** option from the **Database** menu. Of course, using the **Delete Results** option will permanently eliminate the results. Use it cautiously.

4.2.7 Printing Results

To print your results, select the **Print Outs** from the **Operations** menu which is found at the top where the menu bar is located. In order to select **Operations** menu press <**Alt**> + <**O**> or click on it.

After you have selected **Print Outs** option (Figure 19) will appear. The following paragraphs describe each of the options available on the **Print Results** screen:

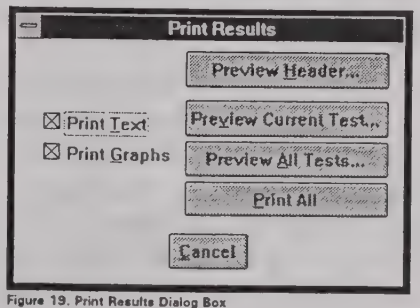

Figure 19. Print Results Dialog Box

Print Graphs

With this option selected, the Display and Printout options will include the graphs appropriate to the tests you have performed. To select this option you can simply click the left button of the mouse while the mouse pointer is on the box left to the Print Graphs option. If you are using the keyboard, press **<Alt> + <G>**. When selected, an '**X**' will appear in the box.

Print Text

With this option selected, the Display and Printout options will include 'text' part of the results only. When selected, an '**X**' will appear in the box left to the option.

Preview Header

This option will display or print the header screen for the test results that you previously obtained. You will be asked if you want a hard copy printout. Choose '**Y**' if you want a printout of only the header screen.

Preview Current Test

This option will display the test results for the test that is currently highlighted. You will be asked if you want a hard copy printout. Choose '**Y**' if you want a printout for that particular test.

Preview All Tests

This option will display each of the test results screens for each of the test results module. At each screen you will be asked if you want a hard copy printout. Choose '**Y**' if you want a printout for that particular test.

Print All

This will print all test results for the test results module. Results and/or graphs will be printed depending on the **Print Text** and **Print Graphs** option settings.

4.3 Example -- Differential Relay (BDD-15B)

4.3.1 Starting *PulseMaster*

Refer to the **EPOCH** or **PULSAR** instruction manuals for the proper way to setup and connect them. Be certain the interfacing cables have been properly connected between the **EPOCH** or **PULSAR** test sets and your IEEE-488 bus card.

The proper way to start ***PulseMaster*** is described in Section 2.2 of this volume. Using standard Windows procedure start ***PulseMaster***.

PulseMaster should load and you should see the **Main Menu** screen shown in Figure 2.

4.3.2 Setting the Instrument Addresses

Refer to section 2.4.6 for a complete description on setting the **EPOCH** addresses. NOTE: If you are using **EPOCH**s, you need two **EPOCH-I** or **10** test sets to perform this test. The harmonic restraint and slope tests require two sources of current. The instantaneous test requires 40 Amperes of current. For this test you will need two **EPOCH-I** or **10** test sets or one **EPOCH-I** or **10** and one **EPOCH-II** or **20**. If you are using a **PULSAR** unit it will need two or three current output modules to do these tests.

4.3.3 Loading the Test Module (Differential)

Load the differential example test module by using the following steps:

1. From the **Main Menu** select **Test**. The **Test** menu (Figure 10) will appear.

2. Select **Load Module**. A listing of test modules will show. Use the **<Arrow>** keys or the mouse to highlight **'differential_example'**. (If **'differential_example'** is not one of the choices, someone may have removed it earlier. You can load it into your database by using the **Backup, Merge, Archive** selection on the **Database** menu. See Volume III for more details.) Press **<Enter>** or click on **Ok**.

3. The screen shown in Figure 20 will appear. The 'differential_example' test module is now loaded.

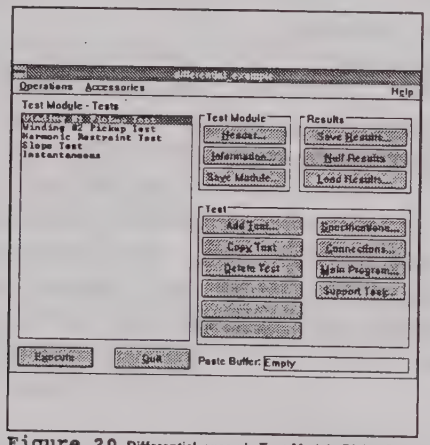

Figure 20. Differential_example Test Module Dialog Box

4.3.4 Checking the Header Screen

To verify and review the header information choose **Header** from the **Test Module** menu. The differential_example header information screen (Figure 21) will appear.

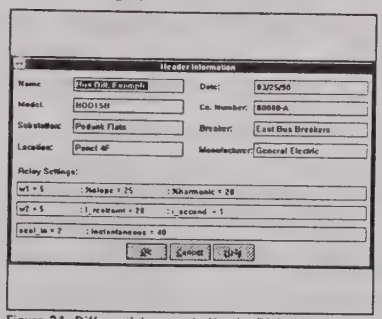

Figure 21. Differential_example Header Dialog Box

The header screen contains a variety of information that is necessary for the test module. The information that is at the top, includes things

like the tester's name, relay model, date, company number and so on. The lower section contains information such as the tap, seal_in, and instantaneous values. These values are actually variables that are used by the testing program.

The header information will vary for different tests; however, the following information should apply to all examples:

1. Usually the only information that should be changed by a Level 1 user (testing only) will be that which is in the top eight (8) blank fields.

2. The information in the lower portion of the screen is determined by the relay settings. Changes should only be made here when relay settings are changed or when one test procedure is used for a variety of different locations.

3. Since changes in the header screen will affect the test results, they should be changed only with full knowledge of what you are doing.

As soon as you have completed your review of the header information, press the <**Esc**> key or click on **Cancel** or **Ok** to exit.

4.3.5 Performing the Tests

IMPORTANT:

If you wish, you may "dry" run the tests with no EPOCH or PULSAR equipment attached. This allows you to evaluate tests before using them. The IEEE-488 driver must be disabled to "dry" run the tests. To disable the GPIB communication, insert an address of '0' for the test set(s) being used. For the purposes of this next section, we assume that you have the EPOCH or PULSAR test sets attached. If you are using PULSAR with RS-232 just unplug the RS-232 line.

After making certain that the **EPOCH** or **PULSAR** test set(s) are connected and the addresses have been properly entered, you may run each of the tests one at a time. To run the test, first highlight it by using the <**Arrow**> keys or the mouse, and then execute it by pressing the <**Enter**> key or clicking on **Execute**.

After you select a test, its **Execute Test** screen will be shown and the changes that are occurring in current or voltage will show. Be certain to follow the on screen directions that are shown.[1]

1. If you are a Level 1 user, you need not understand the information shown on the 'ID' screen. This is information that is selected and/or modified by a Level 2 or Level 3 user. See Volumes II and III for complete explanations of the 'ID' screen.

At the completion of each test, you will be shown a test results screen along with being asked if you want a hard copy printout. For the purposes of this example, say no. We will print out all of the results later.

Execute each test as described above.

4.3.6 Saving Results

To save the results of your tests, invoke the **Save Results Module** item from the **Results** menu. You will be given the opportunity to name the results module. Your company should have established procedures for naming the results modules; however, the following general guidelines may help:

1. Try to select meaningful names that relate to the location, date, type of test, or other such descriptive information. For example, you may wish to name the module using the date and relay name such as:

   03/24/90_PODUNK_900_DIFF

2. Remember that the name you select must be less than 30 characters in length.

3. If you select a name that is already in use, ***PulseMaster*** will alert you and ask if you wish to replace the old module. Selecting **No** will allow you to try again for a unique name.

After you have saved your results you may eliminate them by using the **Delete Results** option from the **Results** menu found on the **Main Menu** or the **Archive Data** option from the **Database** menu. Of course, using the **Delete Results** option will permanently eliminate the results. Use it cautiously.

4.3.7 Printing Results

The methods used to print results described in section 4.2.7 apply to all test result printing. Refer to section 4.2.7 and/or Volume III for complete information.

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